Letter dated:
27 November 2000

From:
The German Environment Agency (*Umweltbundesamt* - UBA), Berlin

To:
European Commission, for the attention of Mr Krämer, Environment DG

Subject: **European Commission July 2000 Green Paper *Environmental issues of PVC***

Ref.: Commission letter of 20 August 2000 (GD ENV - E3 AP/je D (0))

Dear Mr Krämer,

With reference to the above letter and the public hearing held by the European Commission on 23 October 2000, the German Environment Agency is pleased to enclose its comments on the Green Paper. The comments are also being sent by e-mail.

Yours sincerely,

(Signed)

Prof. Dr Andreas Troge

President of the German Environment Agency

C O R R I G E N D U M

Under **question 8** on page 8 of the document from the UBA dated 27 November 2000:

on line 2-3

"While cadmium, lead and organotin can be replaced by systems based on calcium/zinc..."

should replace

"While cadmium, lead and organotin can be replaced by systems based on cadmium/zinc..."

AND

on line 8

“calcium/zinc” should replace “cadmium/zinc”

Comments on the European Commission July 2000 Green Paper *Environmental issues of PVC*

The European Commission undertook to assess the impact of PVC on the environment, as well as related human health aspects, in an integrated manner and on this subject it put forward the Green Paper *Environmental issues of PVC* in July 2000.

The document's objectives are: "Firstly, to present and assess on a scientific basis the various environmental issues, including related human health aspects, that occur during the lifecycle of PVC and, secondly, to consider, in view of sustainable development, a number of options to reduce those impacts that need to be addressed. This should serve as a basis for consultation with stakeholders.

The UBA is pleased that the Commission intends to prepare the ground for a public discussion on PVC on the basis of the Green Paper and to launch a discussion on sustainable development. Both aspects are also objectives of the UBA's work.

Germany has already carried out extensive preliminary work on the questions to which answers are requested in the Green Paper. The following reports and publications are particularly important:

- Reports by the Working Party on PVC of the Federal and Länder Working Group on Chemical Safety (BLAC, previously BLAU), dated 1992 and the reevaluations dated 1995 and 1997

- Report by the Commission of Enquiry on the Protection of Man and the Environment - Evaluation criteria and prospects for environmentally-friendly materials recycling in industrial society, dated 1994

- Publication by the Federal Ministry of Education and Research on the promotion of research and development projects in the field of "Integrated environmental protection in the plastics and rubber industry", dated November 1999

- Study by the German Environment Agency "Fields of action and criteria for preventive, sustainable materials policy based on the example of PVC", dated 1999.

The Green Paper so far covers the production of PVC and PVC compounds, the use of additives (stabilisers, plasticisers) and PVC waste management. After an accurate, well-founded statement on the situation as regards each of the individual areas, the Commission formulates a position on each of the areas and calls for a discussion based on specific questions.

Since the discussion began in the context of the Directive on end-of-life vehicles, the Green Paper focuses mainly on waste management issues.

The Commission obviously does not feel it is necessary to consider the production and processing of PVC any more than is done at the moment beyond the voluntary agreements given by the PVC industry itself. This is a view shared by the UBA.

However, the UBA does believe that, in addition to the present aspects, the Green Paper should also cover the behaviour of PVC in the case of fire and, as far as additives are concerned, should take account of chlorinated paraffins (as fire retardants and secondary plasticisers) and bisphenol A (as an oxidation inhibitor: see the ongoing risk assessment in the framework of the Community's "Existing Substances Regulation").

The European PVC industry gave a voluntary agreement in March 2000 - also in anticipation of possible measures resulting from the discussion of the Green Paper. In our view, this voluntary agreement, as it stands at the moment, does not comply with the formal criteria for voluntary agreements and is not convincing in terms of its content. The agreements need improving in particular as regards the commitments regarding the use of additives. As it stands, the voluntary agreement does not in any way justify delaying the introduction of administrative measures or regulations based on the Green Paper, nor does it make them superfluous.

With regard to the questions asked by the Commission in the Green Paper, we wish to comment by referring in particular to the abovementioned UBA publications (citations appear in italics, the page references are to the publication in German). These are enclosed along with other material (Note: an English translation of the study will be sent as an electronic version).

General preliminary comment:

The Green Paper's questions chiefly ask what instruments should be applied. In its study, the UBA has outlined the instruments which are available. It states:

"*In order to implement a precautionary, sustainable policy on materials, taking account of the "polluter pays" principle, the existing statutory regulations for materials and media should be simplified, further developed and supplemented by means of economic incentives as well as consumer information. The principle of cooperation plays an important part in their definition. The objective can only be attained if all stakeholders involved (e.g. the State, industry, trade, consumers) accept this as a joint task, with the State taking the initiative, being a moderator and laying down the general ground rules. Other stakeholders are called upon to develop initiatives themselves in their own areas of activity.*"

For further information, please refer to pages 31 to 34 of the study. A suitable combination of instruments, regulatory as well as economic and information-based, will have to be defined in the areas concerned according to context.

Question 1

Which set of measures should be implemented to address the issue of the use of lead and cadmium in new PVC? According to what time frame?

The UBA believes that the use of cadmium and lead as a stabiliser for PVC should be stopped. In the case of cadmium, this should be done immediately. On this point, the UBA study states:

"*All prerequisites are in place for the complete substitution of cadmium stabilisers. The phase-out process has been very hesitant so far and should be completed quickly. The substitution of cadmium in stabilisers for PVC in Germany would reduce the use of*

cadmium in products by about 25% compared with the mid-80s. The legal options available should also be used (prohibition of cadmium stabilisation of new PVC in the framework of the Cadmium Directive 91/338/EEC). A switch to lead is however not recommended. The development should as a whole lead to calcium-zinc systems. The phase-out process to date is accepted by all concerned, but in practice it is slow and hesitant (despite pressure having been applied for years, about 25% of the volume of cadmium in use in the mid-80s was still being processed in 1994), which shows that the following accompanying measures are necessary in order to complete substitution:

- *clear commitments should be given by stakeholders in a short timeframe,*
- *alternatively, regulatory measures should be drafted (all PVC applications using cadmium stabilisers to be included in the Community Cadmium Directive),*
- *there should be an obligation to use non-encoded labelling in order to keep the cadmium product cycle closed during recycling,*
- *information should be given to processors, users and consumers about the risks associated with cadmium and the alternatives which exist.*"

With regard to the recycling of used PVC stabilised with cadmium, the following should be noted:

Although cadmium stays in the product cycle and products contain an undesired dilution of cadmium when materials containing cadmium are recycled and mixed into new PVC stabilised by other means, the UBA believes the recycling of waste PVC containing cadmium is necessary in order to conserve resources. This should consist of direct product-to-product recycling with a high proportion of recycled material (UBA: 80%). With regard to other aspects, please see our reply to question 4.

On lead stabilisation, the UBA study states:

"*The substitution of lead stabilisers is technically feasible in terms of materials and is desirable. Cadmium/zinc stabilisers are available; work on technical optimisation and long-term studies on technical suitability are to some extent necessary. According to an oral statement given by the Association of the Plastics Industry (VKE) to BLAU-AG in 1995, it will take at least five more years. The present trend towards an increase in the use of lead for PVC stabilisation must be reversed in the short term. The priority objective is to stop using lead in products with a short life span. In addition, PVC-free alternatives are available for some applications.*

Furthermore, pigments containing lead could soon stop being used and this should be done in an appropriate manner.

The following accompanying measures are necessary:

- *clear commitments should be given by stakeholders in a short timeframe,*
- *alternatively, if these are not given, regulatory measures should be drafted, e.g. in accordance with Council Directive 76/769/EEC ("Internal Market Directive") with national transposition under the Chemicals Act*

– *there should be an obligation to use non-encoded labelling in order to keep the cadmium product cycle closed during recycling,*

– *information should be given to processors, users and consumers about the risks associated with cadmium and the alternatives which exist.*"

Further measures in this context are described in the UBA study on page 86 for cadmium and page 95 for lead. It should be stressed that cadmium and lead must not be replaced by increasing the use of organotin compounds as stabilisers (page 107 of the report). It is not currently possible to give a final assessment of the risks associated with organotin stabilisers; however, on account of numerous hazardous properties they should not under any circumstances be recommended as an alternative.

Question 2
Should specific measures be taken for the use of phthalates as plasticisers in PVC? If so, when and through which instruments?

On this subject, the study states:

"DEHP and other phthalates used as plasticisers in PVC present numerous environmental and health hazards and are present everywhere in the environment. They are therefore incompatible with the defining concept of a precautionary, sustainable materials policy. The action taken should therefore be:

– *a gradual phasing-out of the use of soft PVC while at the same time considering product alternatives (and adipic acid esters as an alternative).*

These alternatives are available, except in a few cases where special properties are needed. The substitution would practically concern the entire range of soft PVC, i.e. in Germany about 250 000 t/a in the main applications of cable insulation, floor and wall covering, artificial leather, tarpaulins, hoses/sections, non-rigid sheeting and various paste applications.

Products/product groups with the highest plasticiser contents should be given priority treatment. Children's' toys made from soft PVC have a particularly high priority as there may be oral exposure in the case of small children. The recycling of soft PVC products can also not be recommended as the introduction of DEHP or other plasticisers into the open materials cycle cannot be avoided. Furthermore the mechanical recycling of soft PVC is often merely "downcycling" (gradual elimination)."

For further details, see pages 117 to 122 of the UBA study. The ongoing EU risk assessment of phthalates in the framework of the Existing Materials Regulation will not provide any conclusive judgment with regard to measures for soft PVC since it deals with one single substance and compares exposure with known effects.

Question 3
Which set of measures would be the most effective to reach the objective of an increase in PVC recycling?

The UBA believes it is sensible to have a stepwise waste disposal plan consisting of mechanical recycling, feedstock recycling, energy recycling and co-incineration in waste disposal plants. Priority should be given to mechanical recycling, provided certain

prerequisites are met. These prerequisites and other aspects are described in the UBA study as follows:

"1. A further expenditure of process energy can be avoided and most energy saved by means of mechanical recycling. If preliminary treatment or collection involves a great effort, however, this advantage can be lost. It is therefore large, uncontaminated building components and composites which can be easily and very effectively separated and which are primarily suitable for such recycling.

2. Feedstock recycling operations are an intermediate step between mechanical recycling and optimised incineration. The degree of energy use ultimately achievable depends, apart from the above factors, on the processes employed. For most processes for the feedstock recycling of plastics (e.g. hydrogenation/gasification), PVC can only be used to a very limited extent because of the HCl produced as it interferes and reduces effectiveness.

3. Incineration, including monoincineration to produce HCl which is known as feedstock recycling, figures last in this cascade. It should be used only if the other processes are ineffective because of the increased effort involved. In optimum conditions, process effectiveness of between 60 and 80% can be achieved.

4. The downward trend in energy efficiency from mechanical recycling to incineration can be explained by the fact that only the combustion energy contained in the materials can be used on incineration, while the energy expended on the process is lost. This loss is relative and absolute and is greater in the case of PVC than of polyethylene because of the high proportion of process energy."

For further details, see pages 52 to 57 of the UBA study. The UBS believes the measures outlined by the Commission in the Green Paper in this context are sensible and necessary on the whole and should be fleshed out in more detail.

Question 4
Should specific measures be attached to the mechanical recycling of PVC waste containing lead and cadmium? If so, which ones?

The UBA study says on this:

"In view of the amount of cadmium contained in windows in use, it has to be considered whether the cadmium should be eliminated rapidly, e.g. by monoincineration of old window frames, or whether it should be mechanically recycled.

The latter seems necessary so as to preserve resources by mixing recycled material containing cadmium with new PVC stabilised by other means, but in the long term this leads to an undesired dilution of cadmium in products and to cadmium remaining in the product cycle.

Taking account of the fact that the stabilisers are relatively firmly bound in the product, mechanical recycling seems appropriate in cases where

* *there is direct product-to-product recycling (no transfer of cadmium to other product ranges in avoidance of the Chemical Prohibition Ordnance by exploiting the permitted contamination limit of 0.01 % by mass) and*

* *a high proportion of recycled material is achieved in the new product. For products made from recycled plastics, the UBA considers that more than 80% recycled material is necessary.*

A low proportion of recycled material in a new window leads to dilution of the cadmium in the technosphere and thus in the environment and is therefore unacceptable. Post-stabilising of the recycled material, if necessary, by means of cadmium-zinc systems is in any case technically feasible according to manufacturers' instructions."

Question 5
Which set of measures would be most appropriate for chemical recycling of PVC waste?

Feedstock recycling processes are an intermediate stage between mechanical recycling and optimised incineration. The degree of energy efficiency ultimately attainable depends, apart from the effort of collection and preliminary treatment, on the processes used. In most processes for the feedstock recycling of plastics (e.g. hydrogenation/gasification), the extent to which PVC can be used is very limited due to the HCl produced which is an interference component and reduces the degree of efficiency. In the 1990s, the PVC industry preferred monoincineration of PVC, but now there is increasing discussion of a slag bath process as proposed by Linde-KCA and a dissolution process (Vinyloop) developed by Solvay for PVC composite materials. The current view is that only by using a mix of different processes will it be possible to manage the very different kinds of PVC waste which are presented for feedstock recycling. The discussion within the PVC industry has been going on for more than ten years and more and more new proposals have been put forward, so the speedy technical development of processes would seem to be a matter of urgency. The Commission's proposals seem to point towards that goal. Other aspects are discussed in the UBA study from the bottom of page 52 to the top of page 55.

Question 6
Which set of measures would be most effective to address the issues linked to the incineration of PVC waste?

The answer to Question 6 must be seen in conjunction with the answers to Questions 3 and 5. Mechanical recycling and feedstock recycling should be considered as a priority before PVC waste is co-incinerated in waste incineration plants. Only if the total effort involved is too great is incineration in a waste incineration plant an option. In such incineration plants, the hydrogen chloride produced from the PVC is usually separated by wet purification and then neutralised. Various processes can be used. The energy balance worsens when the energy required for these processes is considered. Often, only less than 10% of the energy used for the product can be thermally recovered. Because of this and the introduction of heavy metals, there are drawbacks for PVC. As far back as the early '90s, the Federal Government-Länder Committee on Environmental Chemicals (BLAU) concluded that the chlorine introduced into incinerators by PVC should be reduced. In its subsequent report to the Environment Ministers Conference in 1997, the linkage was explained once again. We are enclosing this report with our comments and wish to draw

the Commission's attention in particular to pages 3 to 8. BLAU's later reports on PVC are also enclosed.

In view of the points to which the Commission refers in this context, we would also point out that an extensive scientific investigation of the possible link between PVC entering incinerators and the level of dioxin formed has already shown that no such link exists. We do not consider any further investigation to be required in this respect. Furthermore, incineration plants have to comply with strict emission limits of 0.1 ng/m^3 for dioxins and furans. As regards landfilling as an alternative to incineration, please refer to our answer to Question 7.

Question 7
Are specific measures concerning the landfilling of PVC waste necessary? If so, which are they?

At the moment, most PVC waste in Germany is still landfilled. However, once the Technical Guidelines for Municipal Waste (*TA-Siedlungsabfall*) come into force (loss on incineration limited to below 5%) after 2005, this is no longer an option and waste must be pre-treated. As a further point, the UBA takes the view that the landfilling of PVC products (not only soft PVC) should be avoided even now because of the long-term risks associated with it (in particular, the long period of leaching of toxic additives) (see page 63 of the UBA study).

Question 8
Which are the appropriate instruments for developing a horizontal strategy on PVC? Should a PVC substitution policy for some specific applications be envisaged? If so, how?

The UBA study comes to the following conclusion as regards PVC:

"Many of the problems associated with this mass plastic are due to harmful additives such as heavy metal stabilisers, chlorinated paraffins and plasticisers. While cadmium, lead and organotin can be replaced by systems based on cadmium/zinc, substitution of plasticisers is possible only to a limited extent. Soft PVC should therefore be replaced by alternatives. However, in certain circumstances the substitution of hard PVC would not substantially reduce environmental risks, as a study of two selected PVC products shows. The use of hard PVC (even if it does not contain chlorinated paraffins and is stabilised with cadmium/zinc) must be criticised if there are particular fire risks since PVC often increases the amount of toxic, visibility-impairing smoke and soot and causes material damage as a result of HCl corrosion and more serious fire effects. Furthermore, attention is drawn to the high degree of complexity of the entire PVC material stream, which poses risks in particular in countries with low safety standards.

All in all, the study recommends the following action to improve the PVC stream:

- reduction of the amount of material used for products and services,
- reduction in the consumption of natural materials resources,
- reduction of energy use,
- increase in the long-term life of products,

- improvement in environmentally-friendly recycling,
- minimisation of emissions to the technically unavoidable level,
- reduction in complexity of materials streams,
- reduction of risk to avoid overpollution of the environment by ecotoxic and toxic substances,
- development of substances with properties which are safe for the environment and health.

Specific details concerning these areas of action on PVC are given on pages 147 to 154 of the study.

As far as substitution policy is concerned, the Commission is asked to consider the PVC products given as examples in the study. As stated above, these show that it is not possible to come to general conclusions on this issue and that a specific assessment of individual products is needed taking account of the problems associated with alternatives.